

ORIGINAL ARTICLE

Supporting Factors in Using a Smartphone to Support Access Maternal Health Services in Rural Indonesia: A Qualitative Study

Mustopa¹, Kamaliah Binti Mohammad Noh², Muhammad Hafizurrachman³

¹ Sekolah Tinggi Ilmu Komunikasi Indonesia Maju, Jalan Harapan No. 50 Lenteng Agung, South Jakarta, 12610, Indonesia

² University of Cyberjaya, Persiaran Bestari, 63000 Cyberjaya, Selangor Darul Ehsan, Malaysia

³ Sekolah Tinggi Ilmu Kesehatan Indonesia Maju Indonesia, Jalan Harapan No. 50 Lenteng Agung, South Jakarta 12610, Indonesia

ABSTRACT

Introduction: Lack of availability of health workers, poor infrastructure, vast geographical area, and unaffordable transportation costs are limiting factors for the utilization of maternal health services in developing countries. However, the high penetration of smart phones and internet usage provides an opportunity to increase access to healthcare. The purpose of this study was to explore the supporting factors in the use of smart phones as a medium for health services delivery for pregnant women in rural Indonesia. **Methods:** A qualitative study with a case study design was conducted in 2018 in rural area involving 16 pregnant women with smart phones and 6 village midwives. This study used purposive sampling and in-depth interviews of individual respondent using a semi structured interview guide, following which a thematic analysis was conducted. **Results:** We found 4 main themes, namely smart phone ownership, understanding the benefits and functions of smart phone, the pattern of using smart phone and access to internet networks as well as 11 minor themes. The study found that most of the pregnant women had a smart phones and internet access, and able to use them in daily activities. **Conclusion:** Despite the significant efforts made to develop and expand health services for pregnant women in rural areas, the coverage for maternal health services at health centers is still low. Access to antenatal care in rural areas can be improved via smart phones equipped with health applications developed in accordance with social characteristics.

Keywords: Smart phone, Maternal, Health service, Rural, Indonesia

Corresponding Author:

Mustopa,

Email: mstp97@yahoo.co.id

Tel: +628-5817315641

INTRODUCTION

Access to maternal health services is still a problem for pregnant women in rural areas in developing countries (1). In Indonesia, pregnant women in rural areas also experience limited access to maternal health services (2). Large geographical areas, poor road infrastructure, expensive transportation costs, and lack of availability of health workers are factors in the lack of utilization of health services by pregnant women (3,4). In developing countries, delay of pregnant women in utilizing health services might be caused by knowledge, education, encouragement of husbands and families and the traditional cultural situation. The cultural situations such as customs and beliefs often still do not support health-seeking behavior (5).

Even though access to health services for pregnant women is very important to improve antenatal care, the coverage of maternal health services, particularly in the developing nations is still low, with only 36% of pregnant women in low-income countries completing four ANC visits in 2005-2010 (6). Finlayson and Downe noted that 50% of pregnant mothers in low-and middle-income countries did not receive adequate antenatal care (7). Indonesia in 2010, had only eight provinces from its 34 provinces which met the Millennium Development Goals (MDGs) target of at least one antenatal care visit and no province met the target of four antenatal care visits (8). In 2015, there were only seven provinces that achieved the targets set out by the Ministry of Health's Strategic Plan, which followed the MDGs target of 95% of pregnant women to receive one to four antenatal visits (9).

Utilization of smart phone technology was one way to overcome the difficult terrain, limitations of infrastructure and limited health personnel in

delivering health services for pregnant women. Smartphone technologies have the potential to bridge systemic gaps needed to improve access to and use of health services, particularly among underserved populations (1). Using a smart phone for health services can help health personnel to reach areas and communities that were previously limited. Countries such as in the USA and South Africa, have used information technology and communication (smart phone) for health programs, with the application called Text4-Baby apps (2,10–13). Mobile text messages are potentially powerful for behavioral change and disease prevention because they are cheap and quick (14). Furthermore, text messages could also be used for disease prevention and health promotion (15).

Several studies have shown that there has been little exploration in smart phone use in rural areas of Indonesia (16). However, the reality is that smart phone use among rural communities continues to increase. In Indonesia, smart phone users totaled around 308 million and internet users reached 132.7 million or around 51.5% of the total population of 256.2 million in 2017 (17). Among internet users, around 54 million are active internet users via smart phone (18). In addition, the Indonesian government through the Ministry of Communication and Information has made a policy regarding the implementation of the Integrated Broadband Village Program (IBVP). The Integrated Broadband Village Program is intended to complement network or internet facilities, end-user devices, and applications that are in accordance with the characteristics of rural communities (19). This program is intended for people who live in agricultural villages, fishing villages, and rural villages, which are specifically targeted at beginner level users in operating smart phones.

This study was to explore the supporting factors in the use of smart phones as a medium for health services for pregnant women in rural areas. The development of mobile applications that suit the characteristics of users using smart phone technology is the right choice as it can be used according to needs, unlimited by time and cost (10). Users of this application will be mainly pregnant women and village midwives who have limited interaction due to geographical and infrastructure constraints. Pregnant women can access information related to a healthy pregnancy. On the other hand, village midwives can access data regarding the situation of pregnant women in real-time.

MATERIALS AND METHODS

A qualitative approach using the case study design was conducted in 2018, and participants were 6 village midwives, and 16 pregnant women from 2 sub-districts, namely, Karang Tengah and Ciranjang in Cianjur

Regency, West Java Province, Indonesia. The two sub-districts were chosen purposively and two villages from each sub-district were chosen based on the following village selection criteria; has a village midwife and internet connection. Based on these criteria, Sukajadi and Ciherang villages from Karang Tengah Sub-district, and Cibiuk and Gunung Sari villages from Ciranjang sub-district were selected. From this villages, researchers determined pregnant women as research informants. The inclusion criteria for pregnant women selected as informants were; have a smart phone and fill out informed consent to participate in this study. Before starting this research, all participants were given information about the topic and purpose of the study. In addition, they were told that they were free to participate in research or to stop participation, and written consent was given by each participant.

Interview guides were prepared and given to the interviewers who were trained to understand the prepared interview guideline and the informant's psychological condition, before they conduct practical interviewing. Then, a semi-structured in-depth interview was conducted with each participant individually at different times and places. Village midwives were interviewed in the villages of their respective work area while pregnant women were interviewed during the integrated service post (*Posyandu*) activities. The informants were asked their opinions on smart phones utilization in rural areas, relating to ownership of smart phones, understanding of smart phone usage and function, usage patterns of smart phones, and internet connection.

Every interview with the informant was recorded. The recordings were transcribed and coded, and the themes were identified. In each coding session, key and significant expressions in each text were identified in relation to the topic and the individual.

In this study, the informants were selected by purposive sampling. After 22 interviews, (6 village midwives (VM1-6), and 16 pregnant women (PW1-16), we were theoretically saturated, and no additional information emerged after the 22nd interview. The first in-depth interview conducted by the author lasted between 1 and 2 hours, and several evaluations were held before the interview to build relationships with the people interviewed. Interviews with informants were carried out consecutively because the informants were in different places.

The content analysis was used for data analysis. All of the data were summarized and structured in an orderly manner. In addition, repetitions, events, meanings, and relationships between certain words in transcripts and concepts were determined. At this

stage, the content of the message that needed to be analyzed was defined. In addition, efforts were made to recognize the content analysis unit. Interviews were read several times, and then participants' ideas and experiences regarding smart phones ownership, understanding of the benefits and functions of the smart phones, usage patterns of smart phones, and internet connections were extracted and stored as text. After that, the coding phase was done.

ETHICAL CLEARANCE

This study received an ethics from the CUCMS Research Ethics Committee, Malaysia (Ref. No. CUCMS/VRERC/AL-ER(55/2018)). All participants gave written approval to participate in this study and all interviews were conducted anonymously.

RESULTS

Most (50%) village midwife informants were over 35 years old, ranging from 23 to 48 years old, while most of the informants were pregnant women (56.25%) aged between 31-35 years, ranging from 21-40 years old. Most the majority of the village midwives' education level was Diploma, at 62.5 %. Most of the pregnant women's education level was junior high school, some were from senior high school and a small number were from elementary school.

The gestational age at the interview ranged from 12-35 weeks. Most of them were expecting their second and third children, at 87.55, and a small number were expecting their firstborn, at 12.45%. Most of the pregnant women were housewives, at 68.75%, and the remainder worked as sellers, a staff of village office, school administrator and farmers. A more complete description of the characteristics of the informants was in Table I.

Qualitative Findings

A thematic analysis was conducted from the 16 pregnant women and six village midwives, and the result is presented in Table II by main and minor themes. The interpretation of the thematic analysis was as follows:

The Ownership of Smart phones

One of the main reasons why smart phones can be used as a medium for health services delivery by pregnant women in rural areas was that most people in rural areas generally had smart phones. They had been using smart phones between 1 - 5 years, some pregnant women had smart phones used exclusively as their own, but a small number shared the smart phones with other family members, especially their children.

Most of the informants stated that smart phones were no longer a luxury item possessed by certain groups (Table II). Smart phones have become basic items that can be owned by all groups (Table II). The prices of smart phones were inexpensive, and obtaining them was easy (table II). Buying them with credit plans (short term loans) only required an identity card. Regarding this issue, one of the participants stated:

"I have only 1 Samsung J7 series, but if there are friends who have 2 smart phones, at that time they were bought with a short-term loan, just need ID Card, right now almost everyone already has a smart phone, school children already have a smart phone"

Another informant stated;

"Right now, in general, people have a smart phone, now it's no longer a luxury item, with various kinds, second-hand and cheaper, credit plans are also possible, now many people have more than one smart phone, but I only have one"

Understanding of the Benefits and Functions of Smart phone

During the interviews, most of the informants stated that the people understood the benefit and function of the smart phone. Some participants stated that smart phones were useful to support daily activities, receive and send messages, have direct conversations, for entertainment such as listening to music, watching videos, playing games, and taking a photo (table II). In addition, smart phones can be used for information retrieval through browsing activities.

"I understood WhatsApp (WA), short message service (SMS), is for sending and receiving messages to anyone we want, Facebook too"

Another informant stated;

"I also understood SMS, WA, Facebook, and Twitter too, but what I often use are WA and Facebook. Since I was in junior high school, I often asked friends on how to use them".

Most of the informants stated that the people knew and had often operated several applications on smart phones, such as SMS, WA, social media Facebook, and direct conversations. Only a small number of informants understood and could use Twitter, Instagram, and other internet browsing activities (Table II).

The Pattern of Smartphone Use

Most of the participants stated that most people were using smart phones in almost all places such as homes, markets, schools (when delivering and picking up children), the integrated health service post, even in places of worship (Table II).

Table I : Characteristics of Informants from Pregnant Women and Village Midwife in Cianjur Regency

No	Characteristics of Informans	Pregnant Women (n=6)		Village Midwife (n=16)	
		Frequency	%	Frequency	%
1	Ages				
	< 20 years				
	21-25 years	1	16.67	2	12.50
	26-30 years	1	16.67	4	25.00
	31-35 years	1	16.67	9	56.25
	36-40 years	3	50.00	1	6.25
2	Education				
	Elementary School	0	0	2	12.50
	Junior High School	0	0	10	62.50
	Senior High School	0	0	4	25.00
	College	6	100		
3	Pregnant women's job				
	Unemployed/Housewife			11	68.75
	Agriculture/ farmers			1	6.25
	Sellers			2	12.50
	Staff of office			2	12.50
	Indonesian National Civil Ser- vants / Army	4	66.67		
	Honorary/Contract	2	33.33		
4	Gestational age			2	12.50
	Less than 12 weeks			11	68.75
	12 – 28 weeks			3	18.75
	Above 28 weeks				
5	Number of Children				
	No children	2	33.33	2	12.45
	1-3	4	66.67	14	87.55
	> 3			0	

Table II : Thematic Analysis of using a Smart Phone to Health Service by Pregnant Women in the Rural Area According to Major and Minor Themes

Topic	Major Themes	Informant	Minor Themes
Reason for the use of smart phones for health services for pregnant women in a rural area	The Ownership of Smart phones	Pregnant Women (16)	Smartphone ownership no longer reflects social status. They have become basic items.
		Village Midwives (4)	Smartphone prices were cheap and obtaining it was easy To receive and send messages, pictures, videos, and direct conversations
	Understanding the benefits, and functions of the Smart phones	Pregnant Women (14)	Helping in work activities, socializing, promoting and selling Entertainment (music, photo, watching videos)
		Village Midwives (3)	Browsing information Understanding and being able to operate social media, WA, Facebook, and Twitter
	The Pattern of Smart-phone Use	Pregnant Women (15)	when at home, at work, at school, health facilities, places of worship
		Village Midwives (5)	The usage duration was between 5-15 minutes
Internet Connection	Pregnant Women (14)	internet providers are available and are easy to access	
	Village Midwives (3)	Free wifi provided by the government in each village	

Some of the participants stated that the use of a mobile phone is ubiquitous. In every place, when there was an internet network connection, the main activities are related to smart phones, whether for communication, social media, listening to music, or other activities. Regarding this issue, one of them stated;

"I mostly do it at home, if all the household work is done, then just playing with smartphones, communicating through WA with friends, social media Facebook, and browsing status".

Another participant stated:

"When I have a cellular data, besides at home, at school while waiting for school children, communication through WA with friends, sometimes doing offers merchandise, on Facebook for promotion, it's also I were taught by a child".

The use of smart phones was mostly to receive and send messages to individuals and groups through social media such as WA, socializing via Facebook, taking pictures, twitters, and a small proportion was searching for information. The duration of smart phone use varied depending on the place and time when using it and ranged from 1 to 15 minutes for each use (Table II).

Internet Connection

Most of the participants stated that the internet network facilities in the region were very good; several well-known communication services such as Indosat, XL, Tri, and Telkomsel were well accessed (Table II). But the strength of the internet connection of each of the service providers was not the same in all places, such as at the Cibeber region, most of the informants use the products of Indosat and Telkomsel, while in Ciranjang the XL and Indosat were popular. There was a village office that provides free wifi (Table II). In this regard, one of the participants stated;

"I know, the internet network here is good, we can choose according to what we want, but indeed the power is not evenly distributed, as here the good ones use Indosat, the network is stronger, the others cellular data provider sometimes the network is not too good, depending on the weather too".

Another participant stated:

"I originally used XL, but now using Indosat, the network is better, but because my house is near the village office, often if I don't have cellular data, I can take the Village office wifi ..."

In general, pregnant women often use internet services to communicate socially, and for entertainment through social media. For example, communicating through WA, Facebook, some informants were even browsing to find information.

DISCUSSION

In this study, there were 4 main themes identified: Ownership of smart phones, Understanding the benefits, and functions of the smart phones, type of use of a smart phone, and internet connection.

Ownership of smart phones

We have found that the main reason why smart phones can become a health information medium in rural areas is the pattern of ownership of smart phones in the community. Smart phones as a product of communication technology in the community is no longer an expensive item that can only be owned by certain people, but it has become a communication device for all levels of society, including rural communities, and their use can no longer be separated from their daily activities (16,20). Currently, smart phones are sold over the counter at low prices. Smart phones are not only owned by people who have a lot of money, entrepreneurs, or politicians but from various groups ranging from the upper class to the unemployed (21). Based on age, young people are more exposed to smart phone, including among mothers. Among young individuals, aged 18 to 29 years, up to 85% possess a smart phone (22). The results of the study prove that most pregnant women who are still younger have a smart phone, which is one of the important factors to be considered in smart phone-based pregnancy health services.

Understanding the benefits, and functions of the smart phones

The results of the study have shown that rural communities have understood the functions and benefits of mobile phones with only a small number not knowing all the functions and benefits of mobile phones (16). Mobile phones have been used to support daily activities such as communicating with family members, co-workers, business partners and relatives, especially relatives outside the local area to maintain communication (21,23). Facilities that are often used include sending and receiving via SMS, WA, making and receiving calls through direct conversation. Other uses are in the search for data and information through internet browsing activities. The use of smart phones had helped women in a number of fields such as commerce, information sources for businesses, and as a means to promote and market their products (24). Only a small proportion of pregnant women browsed for information relating to the health of the pregnancy, especially in pregnant women who are young and educated (16). The younger and educated pregnant women have a better understanding about the functions and benefits of smart phones, and the increasing understanding and ability to use smart phones in pregnant women, allow them to be more familiar and quicker to understand and utilize smart phone-based health services.

Type of use of smart phone

Users have become dependent on smart phone technology, and the Smart phone has become a loyal friend their daily activities, irrespective of place and time. Research has shown that smart phone user is pervasive, in homes, workplaces, markets, in schools when delivering or picking up children, and in places of worship when listening to recitation (16). Similarly, other studies have found that smart phone users are oblivious to their environment, as if they are in their own world (21,25). Whether on the road, in the crowds, at home, at work, even in places of worship, the attention of the user is no longer on the people around him, but is focused the smart phone with various kinds of expressions such as smile, anger, laughter, pouting, etc (21,25).

The daily frequency of use is between 1 to 7 times and the duration of use is between 4-15 minutes for each use (16). The results of a study on school children found that it is usual to use Smart phones at rest breaks, on average of 10 minutes, for social media and playing games, while at home, a duration of 2-3 hours each time playing on a smart phone, is more frequently reported (25). The more often pregnant women use smart phones in their activities, the easier it would be to expose them to smart phone-based maternal health information.

Internet connection

The availability of the internet network in rural Cianjur is one of the achievements of the program of Integrated Broadband Village development of the Indonesian Ministry of Information Communication (19). Participants also stated that the internet network was very adequate. several telecommunication service operator products such as Indosat, XL, Telkomsel could be accessed easily.

Rural areas in Cianjur Regency are one of the regions in Indonesia that have succeeded in realizing integrated Broadband Village programs by developing and managing Village websites and getting awards for "initiative" and creativity in using ICTs and domains "Desa.ID" at the Destika festival (26). Other studies in East Java have found that utilization of the internet in smart villages has not only continued the tradition of communication among communities but has also introduced a new culture of obtaining information through the use of ICT in the countryside (20). Increasing internet services in rural areas provide opportunities for smart phone users that are suitable for rural communities (19). The broader internet connection in rural areas will expand the use of maternal health services based on the smart phone.

In contrast, despite the significant efforts made by the Indonesian government to establish and expand health

service centers for pregnant women in rural areas, the number of pregnant women in rural areas who are receiving services at the health centers has not been very considerable. This issue is one of the greatest limitations in implementing strategic programs through the health service centers to improve maternal health in rural areas (6).

CONCLUSION

There are four factors which support the use of smart phones for health services utilization by pregnant women. They are the easy ownership of smart phone, a good understanding of the benefits, and functions of the smart phones, the pervasive use of smart phones; and good internet connection. Consequently, it may be possible to take step toward establishing a strategic program for improving maternal health, by utilizing ICT (smart phones), taking advantage of the expanding internet-connected rural areas in Indonesia, and other countries facing similar challenges of access to maternal health service in rural area.

REFERENCES

1. Chatterjee R, Chaudhuri I, Mahapatra T, Balakrishnan R, Chaturvedi S, Gopichandran V. Continuum of Care Services for Maternal and Child Health using mobile technology – a health system strengthening strategy in low and middle income countries. Vol. 16, BMC Medical Informatics and Decision Making. 2016. p. 1–8.
2. Herlina S, Sanjaya GY, Emilia O. The effectiveness of SMS reminder as a health promotion media for pregnant women in remote areas. SNIMed. 2013;31–8.
3. Hoang H, Le Q, Terry D. Women's access needs in maternity care in rural Tasmania, Australia: A mixed methods study. Vol. 27, Women and Birth. 2014. p. 9–14.
4. Koster W, Ondoa P, Sarr AM, Sow AI, Schultsz C, Sakande J, et al. SSM - Population Health Barriers to uptake of antenatal maternal screening tests in Senegal. SSM - Popul Heal [Internet]. 2016;2(October):784–92. Available from: <http://dx.doi.org/10.1016/j.ssmph.2016.10.003>
5. Jeffery P, Jeffery R. Only when the boat has started sinking: A maternal death in rural north India. Soc Sci Med [Internet]. 2010;71(10):1711–8. Available from: <http://dx.doi.org/10.1016/j.socscimed.2010.05.002>
6. Tata Arcel L, Kastrup MC. War, women and health. NORA - Nord J Fem Gen Res. 2004;12(1):40–7.
7. Finlayson K, Downe S. Why do women not use antenatal services in low and middle income countries? A meta synthesis of qualitative studies. PLoS Med. 2013;10(1):1–12.

8. Agus Y, Horiuchi S. Factors influencing the use of antenatal care in rural West Sumatra , Indonesia. *BMC Pregnancy Childbirth*. 2012;
9. RI K. Strategic planning of health ministry 2015-2019. Jakarta; 2011.
10. Klipstein-Grobusch K, Verwijs M, Miltenburg AS, Browne JL, Borgstein A, Sondaal SFV, et al. Assessing the Effect of mHealth Interventions in Improving Maternal and Neonatal Care in Low- and Middle-Income Countries: A Systematic Review. Vol. 11, *Plos One*. 2016. p. e0154664.
11. Free C, Patel V, Felix L, Haines A, Phillips G, Galli L, et al. The Effectiveness of Mobile-Health Technology-Based Health Behaviour Change or Disease Management Interventions for Health Care Consumers: A Systematic Review [Internet]. Vol. 10, *PLoS Medicine*. 2013. p. e1001362. Available from: <https://dx.plos.org/10.1371/journal.pmed.1001362>
12. Cormick G, Kim NA, Rodgers A, Gibbons L, Buekens PM, Belizan JM, et al. Interest of pregnant women in the use of SMS (short message service) text messages for the improvement of perinatal and postnatal care. *Reprod Health*. 2012;9(9):1–7.
13. Jo Y, Labrique AB, Lefevre AE, Mehl G, Pfaff T, Walker N, et al. Using the Lives Saved Tool (LiST) to Model mHealth Impact on Neonatal Survival in Resource-Limited Settings. *mHealth Mortal impact Model neonatal Heal Serv Deliv*. 2014;9(7).
14. Cole-Lewis H, Kershaw T. Text messaging as a tool for behavior change in disease prevention and management. *NIH Public Access*. 2013;32(1):56–69.
15. Vodopivec-Jamsek V, de Jongh T, Gurol-Urganci I, Atun R CJ. Mobile phone messaging for preventive health care (Review). *Cochrane Database of Systematic Rev*. 2012;12(12):1–57.
16. Sunarsi R, Dirgahayu D. The use of handphone in rural society in sukataris vilage Cianjur region. *J Penelit Komun dan Opini Publik*. 2015;19(1):57–67.
17. Association IIS. Statistical data on internet users in Indonesia. *Internet Marketing*. 2017.
18. Wijaya.K.K. Android and opera browser dominated Indonesian mobile users during 2014. *Techinasia*. 2015.
19. Arifin P. Competition for seven Indonesian online news portals based on the analysis of uses and gratifications. *J Ilmu Komun*. 2013;10(2):195–211.
20. Subiakto H. The usage of internet for the village and villagers. *Masyarakat, Kebud dan Polit*. 2013;26(4):243–56.
21. Mayampoh BO. The behavior of mobile users in the Talaud archipelagic district is loosened. *Semin Antropol*. 2012;1–14.
22. Raichle CJ, Eckstein J, Lapaire O, Leonardi L, Brasier N, Vischer AS, et al. Performance of a blood pressure smartphone app in pregnant women: The iPARR Trial (iPhone App Compared with Standard RR Measurement). *Hypertension*. 2018;71(6):1164–9.
23. Kogoya D. Effect using handphone on society. *Acta Diurna*. 2015;4(1):1–6.
24. Lestari RB. Women empowerment through information technology. *Semin Nas Apl Teknol Inf*. 2010;2010:75–8.
25. Muflih M, Hamzah H, Puniawan WA. Students' use of smartphones and social interaction in SMAN I Kalasan Sleman Yogyakarta. *Idea Nurs J*. 2017;VIII(1):12–8.
26. Hariyanti P. The role of ICT volunteers in the Cikadu Integrated Broadband village program, Cianjur, West Java. *J Komun*. 2017;12(1):19–34.